Model based predictive control of tokamak plasma current profile

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Auteur	Ouarit, Hicham [1], Brémond, Sylvain [2], Nouailletas, Rémy [3], Artaud, Jean-François [4], Basiuk, Vincent [5], Witrant, Emmanuel [6], Autrique, Laurent [7]
Pays	Portugal
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Résumé en anglais	In this work, a new predictive control strategy based on a control-oriented model using a 1D magnetic flux diffusion equation is proposed. The aim is to control the plasma current density to obtain high confinement and good stability of tokamak plasma experiments. The control is designed using both inductive means (variation of magnetic flux at the plasma edge) and non-inductive means (Lower Hybrid Current Drive and Electron Cyclotron Current Drive). Kinetic variables such as the electronic temperature, usually available in real time, are considered as inputs in particular for the estimation of the plasma resistivity. Successful closed-loop simulations have been performed using Tore Supra parameters and experimental data. Sensitivity tests have also been made by varying several parameters of the reference model, showing the robustness of the proposed strategy. The real-time relevance of the method was also successfully checked.
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